

# Airmen Pause to Consider the Safety That Has Been Sacrificed to Speed



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PROMINENT AMERICAN AVIATORS KILLED IN AEROPLANE ACCIDENTS

## The Toll Extorted by the Atmosphere for Man's Encroachments Approaches Two Hundred Lives and Adds Hugely to the Importance of the Present Laboratory Study of Flying Machines, Air Pockets and Air Waves.

THE ever growing number of human lives sacrificed to the advancement of aviation gives us ample reason for pause and serious thought. The toll so far paid is rapidly nearing a total of two hundred since the death of Lieutenant Selfridge, of the United States Army, in September, 1908. Naturally, some of these fatal accidents were to be expected after flying became a money-making spectacle in some directions. The professional aviator felt obliged to make his flights thrilling in the eyes of the spectator, and to that end he has done things of a venturesome nature for which he has paid dearly more than once.

We are not concerned with this phase of the art. Foolhardiness is no real part of the effort to advance human flight, even though attendant mishaps may teach useful lessons. What is of serious concern is the loss of life of those earnestly devoted to the furtherance of the science and the adaptation of the flying machine to the needs of the army and the navy in time of war. These officers stand up for the art of aviation with that spirit of professional devotion which is of the utmost value to the promotion of helpful knowledge, and they have generally avoided those half-raising performances which are valuable only as an asset for the showman.

These calm-minded devotees—the term enthusiasts might be misleading—have earnestly striven to make the most out of the instruments placed in their hands, but in doing this they have made more than one fatal stumble despite their caution. The use of the aeroplane in recent military manoeuvres has exacted its costly price, and it is time that due thought was given some of these many accidents. Strange as it may seem, the recent mishaps which have been most suggestively illuminating have been those that were generally not fatal in their consequences, although some have exacted the lives of the participants.

### A FORCED COLLISION.

In March 13 at Johannisthal, just outside of Berlin, a flying machine driven by Schade and an aeroplane handled by Rottlinger came together while in the air at short distance above the ground. The machines were instantly smashed and sent crashing to the earth. Neither of the aviators was injured, but a passenger was hurt. Unquestionably, this collision was brought about by the mutual effect of the disturbed air between the two machines. The next mishap of a kindred character occurred at Douai, France, on June 19, but with disastrous results. Captain Dubois and Lieutenant Melgnan, both of the army, were operating aeroplanes during a dense fog, and drove into each other while going at high speed. Lieutenant Melgnan was killed almost instantly, and Captain Dubois died in the hospital a few hours later. The machines were splintered by the collision. Here we have a counterpart of conditions which have so often caused trouble upon the water, but conditions which may be even

more frequent aloft under atmospheric circumstances of common occurrence. Of course, the gravity of a collision in the air is unfortunately increased by the necessarily high speed at which the flying machine must advance in order to sustain itself in flight. Here is where aviation differs from navigation.

On June 20, at Aix-les-Bains, Mlle. Helene Dutrieu, while aloft, fell upon two ascending monoplanes, and all three machines dropped to the ground in a heap. The two other aviators were pretty seriously bruised, but Mlle. Dutrieu was injured, fortunately falling upon the underlying machines and thus having the force of her drop greatly lessened. Undoubtedly, Mlle. Dutrieu hit a "hole in the air," and her monoplane started earthward before she could check or control its descent by a gliding volplane. The question is, What caused that hole in the air? Did the movement of the two ascending aeroplanes create the disturbance which narrowly escaped causing a serious catastrophe? This has been answered by subsequent accidents.

### WRECKED BY AN AIR POCKET.

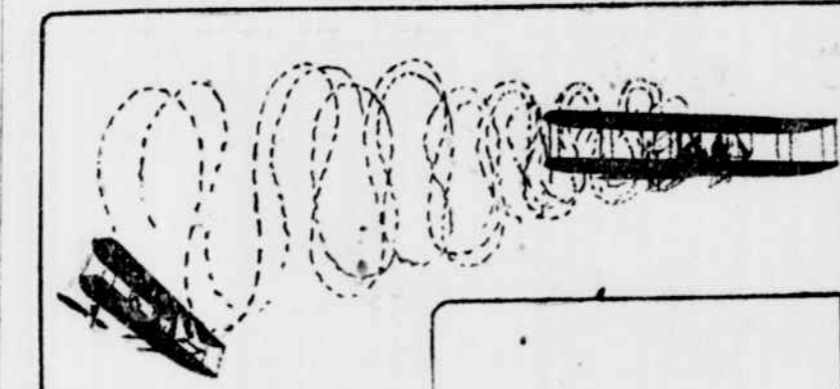
Two French army officers, Lieutenants Briez and Buriez, on July 6 started for Belfort, off the eastern frontier, leaving the aeronautic station at Villa Coubly, just outside of Paris. Lieutenant Briez had the start of his associate, and was already about six hundred feet up, when Lieutenant Buriez overtook him, passing at great speed something like a hundred feet above. Lieutenant Buriez's machine created, so it is said, a downward moving "hole in the air," and this struck Lieutenant Briez's monoplane in such a manner as to destroy its equilibrium. Lieutenant Briez and his machine were dashed to the earth, the aviator having both legs broken and being otherwise seriously but not fatally injured. In this case the innocent cause of the accident was the movement of the aeroplane passing above at a height of a hundred feet, while Mlle. Dutrieu's drop was probably brought about by the manoeuvring of the two monoplanes beneath her. These accidents have brought us face to face with new problems in the art of mechanical flight—they show us that we have much to learn about the air in which we are seeking to vie with the bird.

We have had our own lessons along this line, and these within the last month or more. At Garden City, Long Island, on August 1, two monoplanes started from the ground about the same time—both headed in the same direction. One machine was about twenty feet above the ground, and the other one a short distance higher up and just over the lower one. Suddenly the aviator seemed to lose control of the upper monoplane and it dropped like a dead weight upon the lower machine. Here we have a virtual duplication of the mishap to the two French army officers, save that the upper machine was the one disturbed by the commotion caused by the one nearer the ground, and fortunately the shortness of

the fall prevented serious injury. The advance of the lower machine appeared to cut away or undermine the column of air supporting the upper monoplane. This may seem strange to the novice and to the average layman, but the facts are emphasized when the details of scattered casualties are analyzed.

Toward the end of August, Assistant Naval Constructor H. C. Richardson, U. S. N., was making a flight at Hamptonport preparatory to qualifying for a pilot's license. The instructor at the Curtiss Training School preceded by a short distance the naval pupil with the idea of showing the latter how to per-

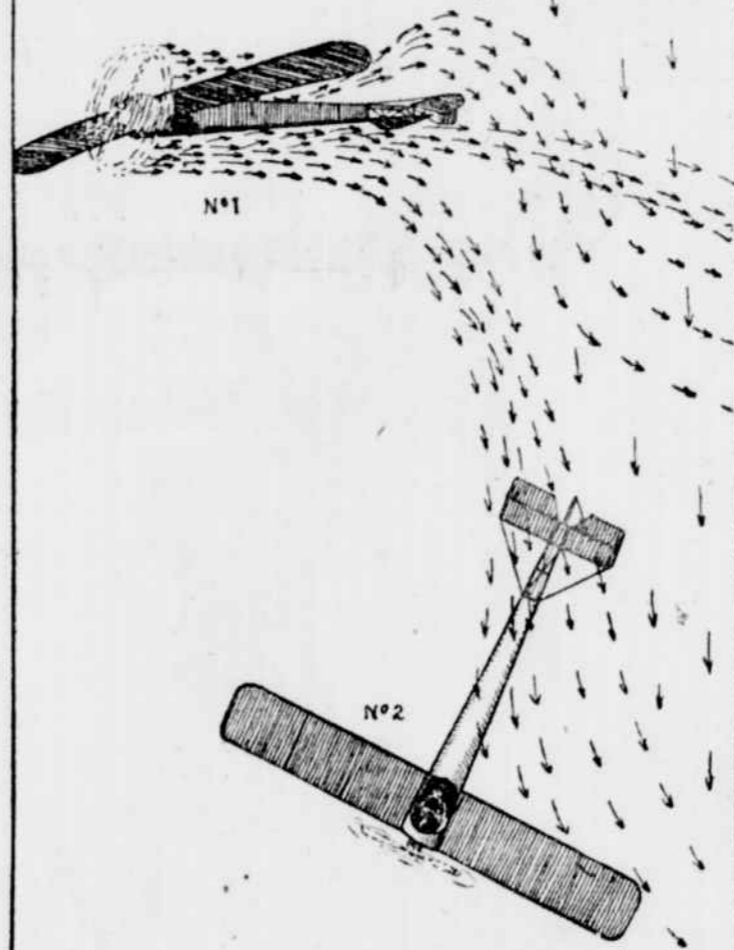
form some of the prescribed test evolutions. Unfortunately, the disturbed air currents created by the hydro-aeroplane ahead nearly upset the following machine, and Naval Constructor Richardson just managed to recover his balance before his hydro-aeroplane took a plunge. Again, this brings home to us how imperfectly is understood even by careful aviators the atmospheric pitfalls which beset them. If the flying machine is to do many of the things planned for it then these conditions or limitations must be properly recognized—otherwise we shall be appalled by the outcome. What are "holes in the air?"



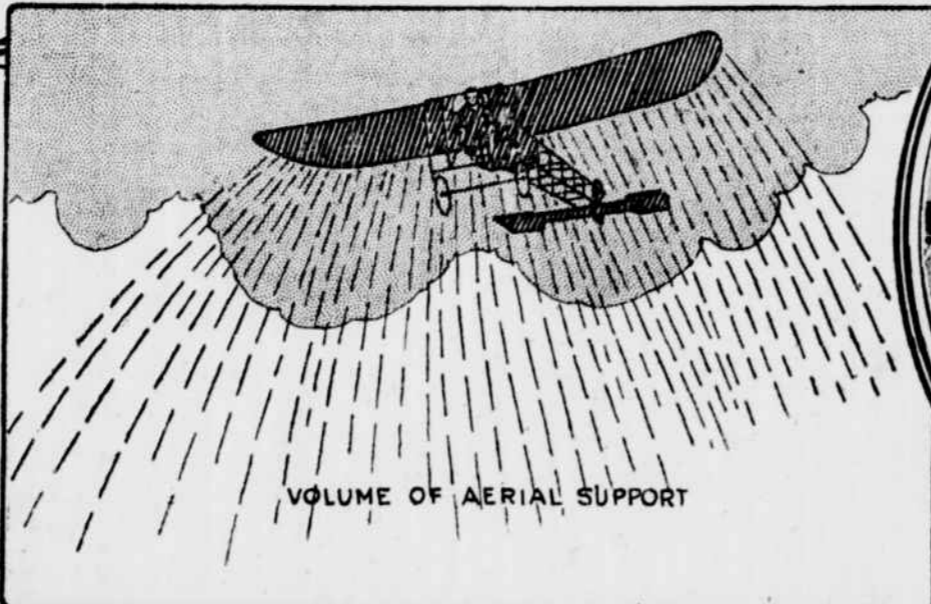
Propeller wake of No. 1 causing No. 2 to stumble

The man in the street has a mistaken notion of what these air holes really are; he imagines that they are areas of partial vacuum which fail to give the flying machine proper support. The hazard they present is reasonably pictured all the greater because there is no visible sign of their presence—the aircraft just suddenly starts to drop and may fall several hundred feet before the movement can be corrected. If corrected at all, if successful, the nicest judgment is required on the part of the aviator lest he suddenly bring pressure to bear upon his planes in excess of their reserve of strength. Collapse of this sort has happened with dire results upon a number of occasions. But, notwithstanding these physical evidences of something wrong, still, in the stricter sense of the word, the term air hole is a misnomer, and a cavity as such does not really exist.

Did you ever watch the surface agitation of a boiling pot? Well, that is substantially a duplication of just what is going on in the air about us. The earth acts like a great reflector of the sun's heat and starts the air boiling below here where we are and sends it upward in great columns of rising atmosphere like the movement of the boiling water in the pot. This is what the meteorologist calls "convictional disturbances" of the atmosphere, and he tells us that this state of things would not annoy the



Downward reacting air currents caused by No. 1 upsetting No. 2



A Flying Machine weighing 650 lbs. in flight draws for support upon more than 8000 cubic ft. of air at sea-level pressure. It is the reaction of burdened air, when relieved, that creates aerial disturbances

aviator if the venturesome airman would only keep aloft at a height of from four to five miles—a matter of from 25,000 to 26,000 feet in round numbers! Georges Legagneux has recently reached the amazing height of 15,796 feet. This is far beyond practical altitude, and we must not forget that the motor is even more sensitive to diminished atmospheric pressure and scant oxygen than the human being. Monsieur Legagneux went as high as his motor could breathe, so to speak, and function, and he did a thoroughly foolhardy thing. In order that he might retain full consciousness, the aviator had recourse to an oxygen tank. This performance, however, serves to show us that the limits of practical flight are nearer the earth, and within that atmospheric belt or region of "convictional disturbances."

perature of the air when shaded. These vary from season to season, and with the changing conditions within each season. Now what happens when an aviator is aloft in a flying machine?

The evenness of the aviator's flight or the uniformity of his line of advance—whichever you choose to call it—is controlled by the constancy of the pressure which the air exerts on the under or lifting side of the planes as his machine is driven forward by its motor. The net result is a sustaining or lifting moment, as the engineer expresses it. If the approaching air, instead of moving horizontally or upward in opposition to the surface of the planes, should be falling, then the support of the flying machine is suddenly diminished to that extent, and the aeroplane drops. You have flown a kite as a boy, and you know how much

quicker it rose sharply the stronger the wind blew, and you know just what at-waves happened when the wind either shifted or lost its force. Either one of these constituted in effect an air hole. Again, if the aviator is travelling against a stratum of wind of a definite speed, and then purposely descends, reaching an air belt of lower speed or altered direction, these changes may reduce the force of the air striking the surfaces of his planes, and this drop in pressure may cause his machine to fall speedily earthward. This is another proof, of course, of the imaginary vacuities in the air.

We must bear in mind that the problem of the flying machine is quite distinct from that of the balloon. The balloon floats because it is either lighter than the air it displaces—when it rises—or remains at a fixed altitude because there is a

perfect balance between its weight and that of the air which it thrusts aside. It remains aloft whether drifting with the wind or being driven by a motor. The heavier-than-air flying machine, on the other hand, is sustained in flight only so long as its movement forward arouses sufficient opposition on the part of the air to lift or to sustain it. When the propellers cease to revolve the aeroplane starts earthward, and disaster can be avoided only by volplaning or performing a sweeping spiral descent. A manoeuvre of this sort is nothing more nor less than a modified drop. The safety of the aeroplane, therefore, when in midair, depends upon the nice balancing of the machine and the proper equalizing of pressure upon the planes. Eddies in the air or any other disturbance which will bring the aeroplane into conflicting atmospheric belts or zones will imperil the stability of the machine and the life of the aviator unless he be ever watchful, and there are some of these conditions against which he cannot sufficiently guard.

Let us see if we can get a popular conception of the movements of the air so far as they menace the single aviator and also one or more airmen flying near one another. We have had brought home to us within the last twelve months the meaning of suction between ships, and we have grasped something of the magnitude of the disturbing forces set up in the water by large bodies in motion and the consequent reactions upon neighboring craft. Ships weighing thousands of tons have been irresistibly drawn together by reason of this disturbed equilibrium of the surrounding water. In other words, it

A vessel floating on the water and moving at moderate speed makes only a few small waves, which are soon dissipated upon the surrounding surface, and the water following in behind it to fill up the cavity formed by the boat's advance effects this adjustment so deliberately that only a small nearly zone is drawn upon. The very nature of the water's incompressibility and its comparative sluggishness makes this so.

The flying machine, in going ahead, hits the air a succession of rapid blows, and by this causes an area of compression which is equal in the force of its reaction to the weight of the flying machine. The fact of it is, this compression actually affects a volume of air equal in weight to the air craft it sustains, and as a cubic foot of atmospheric air weighs only  $\frac{1}{8}$  of a pound at the freezing point, a little figuring will show how wide is the area upon which the aviator must draw for his support.

What happens then when the flying machine has moved onward and the atmosphere tries to resume its normal state? The reaction is like the release of a spring, and the air acquires a vibratory motion—greater in a vertical direction—akin to the prolonged bobbing of a partly water-soaked log after being hit a blow. But this is not all.

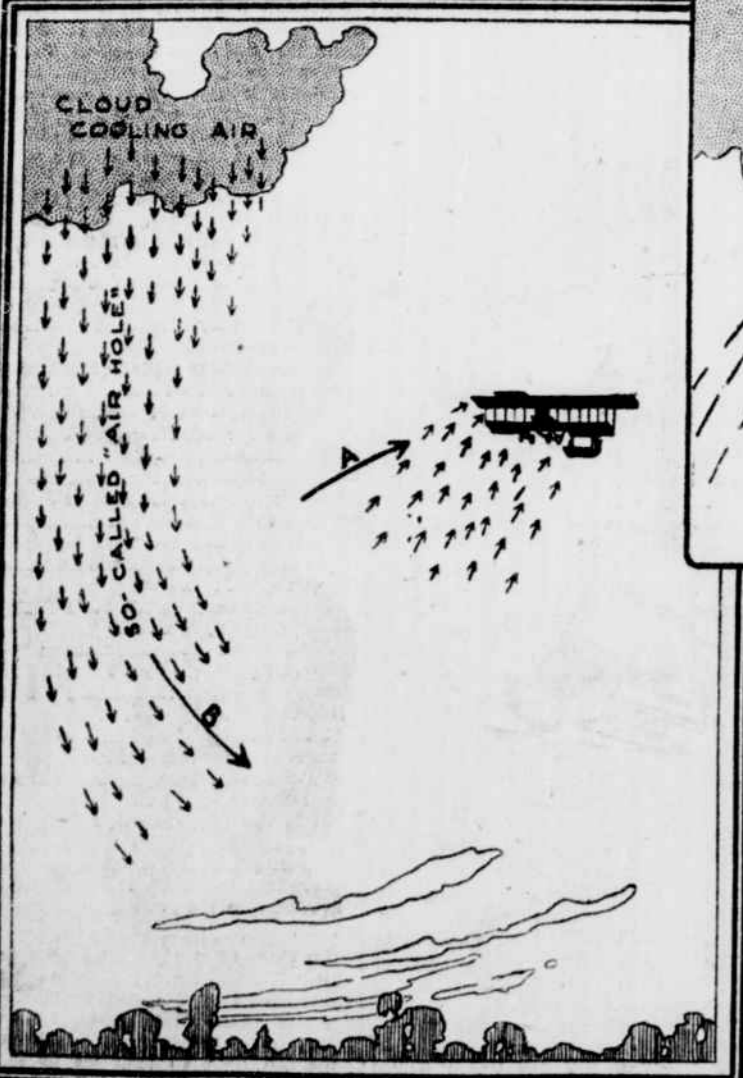
### AT BOTTOM OF AN AIR OCEAN.

We are living at the bottom of an ocean of air, and we are living in that region of the atmosphere where it is densest. The natural tendency for the atmosphere is to fall when not made lighter by heat and caused to rise. An aeroplane shooting through this lower belt is substantially knocking out the foundations from beneath the atmospheric columns reaching many thousands of feet heavenward, and we have in the air a virtual duplication of our bobbing log many, many times repeated at every stage of the onward movement of the flying machine and the successive reactions of the compressed air which has momentarily sustained that mechanical flight. Isn't it clear, then, that an aviator when passing above or below another aviator is either stumbling into air holes thus created or producing a similar condition to menace his nearby fellow? The airman advancing at the greater speed will produce the wider area of disturbance and, within any prescribed limit, the more dangerous reaction.

The flying machine when aloft is in a state of decidedly delicate equilibrium, otherwise the mere flexing of wing tips would be incapable of correcting its horizontal position. Any change of pressure at the extremity of its wings is equivalent to adding or reducing the weight at the one of the other tip, and an upsetting movement is started. It is quite probable that even though one aeroplane may be a full hundred feet above or below another, still the greater speed of the overtaking machine may cause a sufficient downward movement on the part of the air to overweight suddenly one wing of the other machine. This is certainly what happened in the case of Lieutenant Briez, Mlle. Dutrieu and a number of others.

This hazard can only be lessened by increasing the stability of the flying machine, i. e., its inherent tendency to maintain a horizontal position, and this, unfortunately, has its limits, because too much stiffness of poles would only tend to make it more difficult to control the other movements of the machine, and a certain flexibility of action is essential. What is evident, then, is that a number of aviators cannot safely act in concert if their associate operation calls for a close formation. They can only co-operate without needless hazard if they are pretty widely separated, approaching near to one another will involve peril and possibly a needless sacrifice of life. The task set the investigators is that of finding how wide is the region of agitation created by a flying machine in flight, and, with this knowledge, to prescribe the proper distances which aviators must observe when approaching one another. The subject is suggestively filled with a number of vital questions. Any one who has

Continued on fifth page.



A. Normal direction of Supporting Air  
B. Direction of column of cooled and heavier air



"Triad" ready to rise from water. Capt. Chambers (with life preserver) upon box with Ellyson